# STARTING THE BANSHEE MICROGRID DEMO ON TYPHOON HIL (with Eaton Microgrid controller)

1. Connect HILs in ring
2. Ensure all 4 HILs are connected via USB and detected by Typhoon HIL Control Center.
3. Firmware’s of all HILs were designed in 2017.1, you are able to upgrade firmware safely.
4. Load model (Banshee\_Feeder\_1\_2\_3\_v3.cpd)
5. Load settings and custom UI (use the SCADA version (available on integration main branch)). Cui file is ‘banshee\_cui\_high\_res.cus’. Other cui files exist for different purposes.
6. Set “Import Request” and ‘PF Request” to 0 (this stops microgrid controller from trying to start operations)
7. OPTIONAL STEP FOR VERIFICATION: Check if the speed feedbacks of NG and Diesel are correct. You can do this by starting both 200hp Induction motor loads (turn SELSs on and turn on the motor switches). If you see the Woodward HMI indicating an overspeed problem, then it means they are reading the wrong speed feedback. Correct the problem by changing DO13 of the HIL2 and HIL3: If speed feedback was on the generator, change it to the induction machine. If it was on the induction machine change it to the synchronous generator.
   1. NB: Stop the simulation and restart again once you have verified that the speed feedbacks are correct. This is because you want to start the SELs from the microgrid controller. This step is not needed after the speed feedback issue is fixed on integration.
   2. If the Woodwards are stuck in a ‘START FAIL’ error that will not clear even when the simulation is running, the only way to clear these faults is either: (i) power cycle the Woodwards or (ii) use the Toolkit tool to clear the alarms. We are talking with Woodward Engineers to figure out this bug
   3. In some rare cases: the SEL relay remote bits RB01 and RB02 are stuck at high. This means they are being asked to sync and trip at the same time. To solve this issue, open the ACSELERATOR HMI and connect to the offending relay. Then go to ‘Control Window’, rightclick on RB01 and RB02 and clear the bits.
   4. The local level controls (192.168.10.242 to 192.168.10.245) of the microgrid controller should already be properly configured. There should be no need to play with them. A different document describes how to reconfigure them.
8. Start simulation
9. Go to the microgrid controller interface (192.168.10.4) and click ‘DEMO START’ and confirm it. Result: The SEL relays will close and all other non-intertie relays will close as well. If for some reason the lower relays (simulated relays) don’t close do any of the following: (i) click ‘Relay Trip Reset’ button on Typhoon CUI or (ii) click ‘DEMO RESET’ on Microgrid controller interface
10. Start the EPC PV inverter as this inverter is NOT under the control of the microgrid controller. Start the inverter by simply clicking ‘PV START’. Set the Idref as you desire (by default it should be 3550A). NB: (i) The EPC current feedback is divided by 10 (i.e. we are 'tricking' EPC into injecting 10x more current). (ii) EPC firmware is still experimental, so it will crash sometimes. If PV shuts down for any reason, restart it by clicking ‘PV START’.
11. If you desire, turn on the PV profile (set ‘Profile’ to running).
12. Enable the control of the Microgrid by the Eaton Microgrid Controller. Do this by setting ‘DMS Import Request’ to 1. The Eaton will: (i) Start the EPC ESS Inverter (ii) Start both Woodward Gensets (iii) Adjust the active power and power factor such that they meet the values set in ‘DMS import Value’ and ‘DMS PF Value’. (DMS PF Value is only asserted when ‘DMS PF Request’ is 1)
13. Cause intentional island of Feeders 1 & 3: First input the DMS Import value as 0kW then wait for the microgrid controller to push the power on each feeder such that the combined output is close to 0. Then you can open F1 and F3 (by pushing ‘TRIP’ on SELs) and observe that the generators actually regulate the frequency in each feeder as desired.
14. Reconnect F1 and F3 by: (i) Clicking ‘DEMO START’ on microgrid controller interface or (ii) manually clicking ‘AUX’ on SELs